

## CLAIMS

What is claimed is:

1. A dual-wall catalytic converter to be installed in a motor vehicle comprising:

a first tube defining a hollow interior having a first diameter;

a second tube defining a hollow interior having a second diameter wherein the first diameter is larger than the second diameter such that the second tube is inserted inside the hollow interior of the first tube;

wherein the first tube and second tube are expanded to a pre-determined shape such that the first tube when expanded defines an outer housing and the second tube when expanded defines an inner housing inside the outer housing;

a gap defined between the inner housing and the outer housing;

wherein the pre-determined shape of the outer housing and inner housing comprises a central part, a first part and a second part, wherein the central part tapers from a relatively larger diameter to a smaller diameter such that the first part and the second part are connected to the central part along the transverse axis of the catalytic converter;

wherein the inner housing is integrally connected to the outer housing by deforming an end portion of the first part and second part of the outer housing such that the end portion is in contact with the first part and the second part of the inner housing; and

a catalytic substrate inserted within the inner housing.

2. The dual-wall catalytic converter of Claim 1 wherein the first tube and the second tube are expanded using a hydroforming process.

3. The dual-wall catalytic converter of Claim 1 the first part of the inner housing and the outer housing is separated from the central part along the transverse axis to insert the catalytic substrate into the central part of the inner housing.

4. The dual-wall catalytic converter of Claim 1 wherein the central part of the inner housing and the central part of the outer housing are co axial with each other.

5. The dual-wall catalytic converter of Claim 1 wherein the diameters of the first part and the second part of the outer housing and the inner housing are equal.

6. The dual-wall catalytic converter of Claim 1 wherein the first part and the second part of the inner housing extend longitudinally beyond the first part and the second part of the outer housing.

7. The dual-wall catalytic converter of Claim 1 wherein the central part of the outer housing and the inner housing is cylindrical.

8. The dual-wall catalytic converter of Claim 1 wherein the central part of the outer housing and the inner housing is non-cylindrical.

9. The dual-wall catalytic converter of Claim 1 wherein the first part and second part of the outer housing and inner housing are cone shaped.

10. The dual-wall catalytic converter of Claim 1 wherein the outer housing and inner housing are made of stainless steel.

11. A dual-wall catalytic converter to be installed in a motor vehicle comprising:

an outer housing having a first part , a second part, and a central part between the first part and the second part, wherein at least the first part or the second part is connected to the central part along the transverse axis of the dual-wall catalytic converter;

an inner housing inside the outer housing, the inner housing having a first part , a second part, and a central part between the first part and the second part, wherein at least the first part or the second part is connected to the central part along the transverse axis of the dual-wall catalytic converter;

such that the first part , the second part, and the central part of the outer housing are coaxial with the first part , the second part, and the central part of the inner housing;

wherein the inner housing is integrally connected to the outer housing by deforming an end portion of the first part and second part of the outer housing such that the end portion is in contact with the first part and the and second part of the inner housing; and

a catalytic substrate in central part of the inner housing.

12. The dual-wall catalytic converter of Claim 11 the first part of the inner housing and the first part of the outer housing are separated from the central part of the outer housing and inner housing respectively, along the transverse axis to insert the catalytic substrate into the central part of the inner housing.

13. The dual-wall catalytic converter of Claim 11 wherein the diameter of the central part of the outer housing is larger than the diameter of the first part and the second part of the outer housing.

14. The dual-wall catalytic converter of Claim 11 wherein the diameter of the first part and the second part of the outer housing are equal.

15. The dual-wall catalytic converter of Claim 11 wherein the diameter of the central part of the inner housing is larger than the diameter of the first part and the second part of the inner housing.

16. The dual-wall catalytic converter of Claim 11 wherein the diameter of the first part and the second part of the inner housing are equal.

17. The dual-wall catalytic converter of Claim 11 wherein the first part and the second part of the inner housing extend longitudinally beyond the first part and the second part of the outer housing.

18. The dual-wall catalytic converter of Claim 11 wherein the central part of the outer housing is cylindrical.

19. The dual-wall catalytic converter of Claim 11 wherein the central part of the outer housing is non-cylindrical.

20. The dual-wall catalytic converter of Claim 11 wherein the central part of the inner housing is cylindrical.

21. The dual-wall catalytic converter of Claim 11 wherein the central part of the inner housing is non-cylindrical.

22. The dual-wall catalytic converter of Claim 11 wherein the first part and second part of the outer housing are cone shaped.

23. The dual-wall catalytic converter of Claim 11 wherein the first part and second part of the inner housing are cone shaped.

24. The dual-wall catalytic converter of Claim 11 wherein the outer housing and inner housing are made of stainless steel.

25. A method of forming a dual-wall catalytic converter the method comprising the steps of:

having a first tube of first cross-section;

having a second tube of second cross-section wherein the second cross-section is smaller than the first cross-section;

placing the second tube inside the first tube;

hydroforming the first tube and the second tube into a predetermined shape such that the first tube forms an outer housing and the second tube forms an inner housing wherein the inner housing and the outer housing comprise, a first part , a second part and a central part between the first part and the second part, such that the central part tapers from a relatively larger diameter to a smaller diameter;

deforming an end portion of the first part and second part of the outer housing such that the end portion is in contact with the inner housing;

separating the first part of the outer housing from the central part such that the first part is cut along a transverse axis;

separating the first part of the inner housing from the central part such that the first part is cut along a transverse axis; and

inserting a catalytic substrate in the central part of the inner housing.

26. The method of Claim 25 further comprising the steps of:

joining the separated first part to the central part of the inner housing along the transverse axis of the inner housing to seal the catalytic substrate in the central part of the inner housing;

joining the separated first part to the central part of the outer housing along the transverse axis of the outer housing; and

joining the deformed ends portions of the outer housing to the inner housing such that the inner housing and the outer housing are one integral piece.